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(54) **A HYPODERMIC NEEDLE WITH PROTECTION DEVICE**

SUBKUTANNADEL MIT SCHUTZVORRICHTUNG

AIGUILLE HYPODERMIQUE A DISPOSITIF DE PROTECTION

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Description

The present invention relates to a hypodermic needle with a device for protecting against the risks of infection.

It is known that the presently used hypodermic needles for sanitary use have not substantially changed compared with the commonly known type.

As a matter of fact some attempts have been carried out in order to prevent the needle from infecting a handler after the use of the hypodermic needle, but in practice they did not get the success they perhaps deserved, so that things are still in the well known initial state.

Document WO-A-8910767, which is used as a basis for the preamble of claim 1, refers to a needle assembly for a syringe, said needle assembly being provided with a protecting cap retained by a spring which is maintained compressed until a clamp is removed, thereby biasing the cap into a position where it covers the end of the needle. Document US-A-4728321 refers to a syringe cap provided with an adhesive holding plug slideably mounted on the cap for cementing the needle after use by applying an impact force on the plug in a direction against the needle.

The only true reality is that at present in almost all cases disposable syringes and needles are used, i.e. adapted for just one use and properly protected before their using by suitably sterilised packagings, but not protected after use.

An object of the present invention is to overcome this drawback by providing a hypodermic needle which is easy and practical to be used and nevertheless equipped with an effective device for the protection against infection.

This and other objects of the present invention are achieved by the device as claimed in claim 1.

The protection device substantially comprises a cap or a hollow member having a cylindrical or truncated cone shape, with piercing-resistant walls having an inner irregular profile snap-secured to a base supporting the needle, and provided at its base with a resilient element formed like a coil or sheath with a marked propelling capability, and at the other end with a preferably eccentric hole.

Within the cap cavity there is provided a pocket, outwardly defined by the cap walls and inwardly by a pierceable metal foil, with such pocket containing an adhesive and air-hardening material, in case supported by a resilient spongy material.

Said adhesive and hardening material is to be understood as comprising a physical-chemical composition adapted to envelop the portion of the needle stucked thereinto after use, which occludes the hole and sets very quickly, so as to render the hypodermic needle no longer separable from the protection cap.

Said snap engagement of the cap to the needle supporting base provides three main different embodi-

ments of the invention: a first manually operated one; a second which is semi-automatic; and a third one which is a fully automatic and actually preferred embodiment.

According to the first embodiment, the cap is locked onto the needle base by a series of cooperating snap retainers located on the inner wall of the cap and on the outer wall of the needle base mating the cap: a short manually imparted displacement of the cap causes the cap to be released from the base, and allows it to spring upward to wholly shelter the needle. It is to be understood that said displacement can even be imparted with the needle still inserted in the skin, so that the cap is released and springs forward to shelter the exposed portion of the needle, and remains ready to wholly cover it, as soon as it will be extracted from the skin.

According to the second embodiment, the cap is retained by the needle base through a series of retainers provided with an inclined surface: the pressure applied by the skin to the needle cap while pricking lowers said cap with respect to its mating base, causing said locks to slide along said inclined surfaces, so that the cap is rotated with respect to the base and it is disengaged from said base. In said case, the sheltering of the needle by the cap is ensured after the prick has been executed.

According to the third and actually preferred embodiment of the invention, the cap is linked to the base of the needle by a lever device, pivotally secured to the wall of the base and cooperating with a recess in the wall of the cap; as soon as the needle is inserted into the skin, the fluid displaced by the syringe piston acts upon said lever element and causes it to rotate enough to disengage it from the recess provided in the cap, thus allowing the action of the cap propelling means.

The present invention will be now described with details with particular reference to the accompanying drawings, that are supplied as non limiting examples, in which:

Fig. 1 is a side elevation view of a hypodermic needle without the protection cap;

Fig. 2 is a side elevation view of a needle in accordance with the invention with the protection device in its retracted position;

Fig. 3 is a side elevation view of a needle in accordance with the invention with the protection device in its extended position;

Fig. 4 is a scrap side elevation view of the cross-sectioned cap showing some of its features;

Fig. 5 is an axial cross-section of the cap pertaining to an automatic-snap embodiment;

Fig. 6 is another axial section of the cap in accordance with another automatic-snap embodiment;

Fig. 7 is a diagram of the snap device for the manually operated system;

Fig. 8 is a diagram of the snap device for the semi-automatic system;

Fig. 9 is a schematic side elevation view of the needle with the protection device before the insertion into the skin;

Fig. 10 is a view similar to Fig. 9 showing the needle with the associated protection device just inserted into the patient's skin;

Fig. 11 is a view similar to Figures 9 and 10, showing the needle with the protection device just extracted from the patient's skin.

As clearly shown in the Figures, the subject protection device of hypodermic needles for preventing infections substantially comprises a cap or hollow member shaped like a truncated cone, with piercing-resistant walls 3, having an inner irregular profile 5, which member can be snap-secured to a base 7 supporting the needle 9, and provided at its base 7 with a resilient element 13 formed like a coil or sheat, and exhibiting a marked propelling capability, and with a preferably eccentric hole 17 at the tip 15 thereof.

Inside the cavity 19 of the cap 1 there is provided a pocket 21, outwardly defined by the cap walls 3 and inwardly by a pierceable metal foil 23, with such pocket containing an adhesive and air-hardening material 25, in case supported by a resilient spongy material.

This adhesive and air-hardening material 25 is to be understood as comprising a physical-chemical composition adapted to envelop the portion of the needle 9 stucked thereinto after use, which occludes the hole and sets very quickly, so as to render the hypodermic needle 9 no longer separable from the protection cap 1.

Said snap engagement of the cap 1 to the base 7 supporting the needle 9 provides three substantial different embodiments of the invention: the first is a manually operated one; the second is a semi-automatic one; and the third is a fully automatic and actually preferred embodiment.

According to the first embodiment, the cap 1 is locked onto the needle base 7 by a series of cooperating snap retainers 27 (see Fig. 7) shaped like an upturned L, located on the inner wall of the cap 1 and on the outer wall of the needle base 7 mating the cap 1; a short manually imparted displacement of the cap 1 causes the cap to be released from the base 7, and allows it to spring upward to wholly shelter the needle 9.

Fig. 7 illustrates a sequence of the different retainer positions, respectively in a locked cap condition, in an unlocked cap condition and then in a completely released condition.

It is to be understood that the displacement can be imparted with the needle 9 still inserted in the skin, so that the cap 1 is released and springs forward to shelter the exposed portion of the needle 9, and remains ready to wholly cover it, as soon as it will be extracted from the skin.

According to the second embodiment, the cap 1 is retained by the needle base 7 through a series of retainers 29 (see Fig. 8), provided with an inclined surface:

the pressure applied by the skin to the needle cap 1 while pricking lowers said cap 1 with respect to its mating base 7, causing said locks to slide along said inclined surfaces, so that the cap 1 is rotated with respect to the base 7 and it is disengaged from said base. In this case, the sheltering of the needle by the cap 1 is ensured after the prick has been executed.

Fig. 8 illustrates a sequence of the different retainer positions, respectively in a locked cap condition, in an unlocked cap condition and then in a completely released condition.

According to the third and actually preferred embodiment of the invention shown by Figures 5 and 6, the cap 1 is linked to the base 7 of the needle 9 by a lever device 31 or 33, pivotally secured to the wall of the base 7 and cooperating with a housing recess 35 in the wall 3 of the cap 1; as soon as the needle 9 is inserted into the skin, the fluid displaced by the syringe piston acts upon said lever element 31 or 33 and causes it to rotate enough to disengage it from the recess 35 provided in the cap, thus allowing the action of the cap propelling means 13.

In Figures 9, 10 and 11 there are schematically illustrated the steps of a pricking carried out with a needle 9 equipped with the protection device shown by Figures 5 and 6.

Fig. 9 clearly shows the needle 9 and the associated protection device 1 locked together with the spring 13 compressed.

As soon as the pricking begins (Fig. 10) and the piston moves, the lever device 31 or 33 becomes disengaged thanks to the flow of the liquid inside the syringe, so that the device 31 or 33 snaps and releases the spring 13 which in turn causes the cap 1 to shift forward until it abuts against the patient's skin.

At the end of the pricking (Fig. 11) the needle 9 is extracted from the skin and the spring 13 urges the cap 1 to completely shelter the piercing tip of the needle 9.

Claims

1. A hypodermic needle with an after-use protection device against infection risks, comprising
 - a base (7) supporting the needle (9);
 - a cap (1) slideably mounted along said needle having piercing-resistant walls (3) with an inner irregular profile (5), said cap (1) being provided at its closed end (15) with a hole (17) for the passage of the needle (9) and being snap secured to said base (7);
 - cap propelling means (13) with a marked propulsive capability between said cap (1) and said base (7), said propelling means (13) being secured to said base (7), surrounding said needle (9) and retaining said cap (1) to shelter the needle (9) when released;

characterized in that inside the cap (1) there is provided a pocket (21), outwardly defined by the cap walls (3) and inwardly by a pierceable metal foil (23), said pocket containing an adhesive and air-hardening material (25),

whereby the needle is rendered no longer separable from the cap when said propelling means (13) is released and said needle (9) is stuck into said adhesive and air-hardening material (25).

2. A hypodermic needle as claimed in claim 1, characterized in that said cap propelling means are provided by a coil spring or sheath.
3. A hypodermic needle as claimed in claim 1, characterized in that said hole (17) is eccentric with respect to the tip (15) of the cap (1).
4. A hypodermic needle as claimed in claim 1, characterized in that said adhesive and air-hardening material (25) are supported inside said pocket (21) by a resilient spongy material.
5. A hypodermic needle as claimed in claims 1 to 4, characterized in that the cap (1) is locked to the base (7) of the needle, by a series of cooperating snap retainers (27) located on the inner wall of the cap (1) and on the outer wall of the needle base (7) mating the cap (1) whereby a short manually imparted displacement of the cap (1) causes the cap to be released from the base (7), and allows it to spring upward to wholly shelter the needle (9), with said displacement that can be imparted even with the needle (9) still inserted in the skin, so that the cap (1) is released and springs forward to shelter the exposed portion of the needle (9), and remains ready to wholly cover it, as soon as it will be extracted from the skin.
6. A hypodermic needle as claimed in claims 1 to 4, characterized in that the cap (1) is retained by the base (7) of the needle (9) through a series of snap retainers (29) provided with an inclined surface whereby the pressure applied by the skin to the needle cap (1) while pricking lowers said cap (1) with respect to its mating base (7), causing said locks (29) to slide along said inclined surfaces, so that the cap (1) is rotated with respect to the base (7) and it is disengaged from said base (7), with the sheltering of the needle by the cap (1) being ensured after the prick has been executed.
7. A hypodermic needle as claimed in claims 1 to 4, characterized in that the cap (1) is linked to the base (7) of the needle (9) by a lever device (31 or 33), pivotally secured to the wall of the base (7) and cooperating with a recess (35) in the wall (3) of the

cap (1) whereby as soon as the needle (9) is inserted into the skin, the fluid displaced by the syringe piston acts upon said lever element (31, 33) and causes it to rotate enough to disengage it from the recess (35) provided in the cap (1), thus allowing the action of the cap propulsion means (13).

Patentansprüche

1. Subkutannadel mit einer Schutzvorrichtung gegen Infektionsgefahr nach dem Gebrauch, umfassend eine Basis (7), die die Nadel (9) trägt; eine Kappe (1), die entlang der Nadel gleitend gelagert ist und durchstech-feste Wände (3) mit einem innen unregelmäßigen Profil (5) aufweist und die an ihrem geschlossenen Ende (15) mit einer Öffnung (17) zum Durchtritt der Nadel (9) versehen und an der Basis (7) durch eine Schnappverbindung befestigt ist; eine Kappenvorschubeinrichtung (13), die eine Verschiebefähigkeit zwischen der Kappe (1) und der Basis (7) aufweist, die an der Basis (7) befestigt ist, die Nadel (9) umgibt und die Kappe (1) festhält, um die Nadel (9) dann abzuschirmen, wenn sie freigegeben ist, dadurch gekennzeichnet, daß Innerhalb der Kappe (1) eine Tasche (21) vorgesehen ist, die nach außen durch die Kappenwände (3) und nach innen durch eine durchstechbare Metallfolie (23) begrenzt ist, und daß die Tasche ein klebendes und luft-aushärtendes Material (25) enthält, durch welches die Nadel dann von der Kappe nicht mehr trennbar ist, wann die Vorschubeinrichtung (13) freigegeben ist und die Nadel im klebenden und luft-aushärtenden Material (25) steckt.
2. Subkutannadel nach Anspruch 1, dadurch gekennzeichnet, daß die Kappenvorschubeinrichtung aus einer Schraubenfeder oder Scheide gebildet ist.
3. Subkutannadel nach Anspruch 1, dadurch gekennzeichnet, daß die Öffnung (17) in Bezug auf den vorderen Teil (15) der Kappe (1) exzentrisch angeordnet ist.
4. Subkutannadel nach Anspruch 1, dadurch gekennzeichnet, daß das klebende und luft-aushärtende Material innerhalb der Tasche (21) von einem elastischen, schwammartigen Material getragen ist.
5. Subkutannadel nach den Ansprüchen 1 bis 4, dadurch gekennzeichnet, daß die Kappe (1) an der Basis (7) der Nadel mittels einer Reihe von miteinander zusammenarbeitenden Schnapphaltern (27) an der Innenwand der Kappe (1) und an der Außenwand der Nadelbasis (7), die mit der Kappe (1) zusammenarbeitet, verriegelt ist, wobei eine kurze, von Hand verursachte Verschiebung der Kappe (1) die Kappe von der Basis (7) löst und ihr erlaubt,

nach oben zu springen, um die Nadel (9) vollständig abzuschirmen, wobei die Verschiebung selbst bei in die Haut eingefahrener Nadel ausgeübt werden kann, so daß die Kappe (1) freigegeben wird und nach vorn springt, um den freigegebenen Teil der Nadel (9) abzuschirmen, und in Bereitschaft bleibt, um sie völlig abzudecken, sobald sie aus der Haut herausgezogen wird.

6. Subkutannadel nach den Ansprüchen 1 bis 4, dadurch gekennzeichnet, daß die Kappe (1) durch die Basis (7) der Nadel (9) mittels einer Reihe von Schnapphaltern (29) gehalten wird, die mit einer geneigten Fläche versehen sind, wobei der mittels der Haut auf die Nadelkappe beim Spritzen aufbrachte Druck die Kappe (1) in Bezug auf die mit ihr zusammenarbeitende Basis abgesenkt wird, so daß die Riegel (29) entlang der geneigten Flächen gleiten, so daß die Kappe (1) in Bezug auf die Basis (7) verdreht und von der Basis (7) gelöst wird, wobei das Abschirmen der Nadel durch die Kappe (1) nach dem Ausführen des Spritzens sichergestellt ist.
7. Subkutannadel nach den Ansprüchen 1 bis 4, dadurch gekennzeichnet, daß die Kappe (1) an der Basis (7) der Nadel mittels einer Hebeleinrichtung (31 oder 33) angelenkt ist, gelenkig an der Wand der Basis (7) befestigt ist und mit einer Aussparung (35) in der Wand (3) der Kappe (1) zusammenarbeitet, so daß bei Einführen der Nadel (9) in die Haut die durch den Spritzenkolben verschobene Flüssigkeit auf die Hebeleinrichtung (31, 33) einwirkt und dieses sich genügend verdrehen läßt, um es aus der in der Kappe (1) vorgesehenen Aussparung freizugeben und damit die Wirkung der Kapenvorschubeinrichtung (13) zu ermöglichen.

Revendications

1. Seringue hypodermique comportant un dispositif de protection après utilisation contre les risques d'infection, comprenant :
 - une base (7) supportant l'aiguille (9) ;
 - un capuchon (1) monté libre en coulissement le long de ladite aiguille, comportant des parois résistant au perçage (3) , présentant un profil interne irrégulier (5), ledit capuchon (1) étant prévu au niveau de son extrémité fermée (15) avec un trou (17) destiné au passage de l'aiguille (9) et étant fixé par encliquetage à ladite base (7) ;
 - des moyens de propulsion du capuchon (13) présentant une capacité nette à l'éjection entre ledit capuchon (1) et ladite base (7), lesdits moyens de propulsion (13) étant fixés à ladite base (7), entourant ladite aiguille (9) et rete-

nant ledit capuchon (1) pour protéger l'aiguille (9) lorsqu'ils sont libérés ;

caractérisée en ce que à l'intérieur du capuchon (1), il existe une poche (21), définie vers l'extérieur par les parois de capuchon (3) et vers l'intérieur par une feuille métallique pouvant être percée (23), ladite poche contenant un matériau adhésif et durcissant à l'air (25), de sorte qu'il n'est plus possible de séparer l'aiguille du capuchon lorsque lesdits moyens d'éjection (13) sont libérés et que ladite aiguille (9) est engluée dans ledit matériau adhésif et durcissant à l'air (25).

2. Seringue hypodermique selon la revendication 1, caractérisée en ce que lesdits moyens d'éjection sont fournis par un ressort à boudin ou par un manchon protecteur.
3. Seringue hypodermique selon la revendication 1, caractérisée en ce que ledit trou (17) est excentré par rapport à l'extrémité (15) du capuchon (1).
4. Seringue hypodermique selon la revendication 1, caractérisée en ce que ledit matériau adhésif et durcissant à l'air (25) est supporté à l'intérieur de ladite poche (21) par un matériau spongieux élastique.
5. Seringue hypodermique selon les revendications 1 à 4, caractérisée en ce que le capuchon (1) est bloqué sur la base (7) de la base de l'aiguille , par une série d'éléments de retenue coopérant par encliquetage (27) placés sur la paroi interne du capuchon (1) et sur la paroi externe de la base de l'aiguille (7) se raccordant au capuchon (1) de sorte qu'un petit déplacement communiqué manuellement au capuchon (1) entraîne le capuchon à se libérer de la base (7), et lui permet de monter brusquement pour abriter complètement l'aiguille (9), ledit déplacement pouvant être communiqué même si l'aiguille (9) est encore insérée dans la peau , de sorte que le capuchon (1) est libéré et se propulse vers l'avant pour abriter la partie exposée de l'aiguille (9), et demeure prêt à la recouvrir totalement, dès qu'elle sera retirée de la peau.
6. Seringue hypodermique selon les revendications 1 à 4, caractérisée en ce que le capuchon (1) est retenu par la base (7) de l'aiguille (9) à l'aide d'une série d'éléments de retenue à encliquetage (29) prévus avec une surface inclinée, de sorte que la pression appliquée par la peau sur le capuchon d'aiguille (1) lors de la piqûre abaisse ledit capuchon (1) par rapport à sa base d'adaptation (7), entraînant lesdits blocages (29) à glisser le long desdites surface inclinées , de sorte que le capuchon (1) tourne par rapport à la base (7) et se

désengage de ladite base (7), la protection de l'aiguille par le capuchon (1) étant assurée après que la piqûre a été exécutée.

7. Seringue hypodermique selon les revendications 1 à 4, caractérisée en ce que le capuchon (1) est lié à la base (7) de l'aiguille (9) par un dispositif à levier (31 ou 33), fixé à la paroi de la base (7) de façon pivotante et coopérant avec un évidement (35) dans la paroi (3) du capuchon (1) de sorte que, dès que l'aiguille (9) est insérée dans la peau, le fluide déplacé par le piston de la seringue agit sur ledit élément de levier (31, 33) et l'entraîne à tourner suffisamment pour le désengager de l'évidement (35) prévu dans le capuchon (1), permettant ainsi l'action des moyens de propulsion du capuchon (13).

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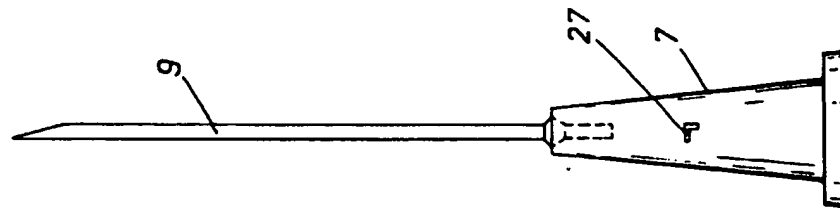


FIG.1

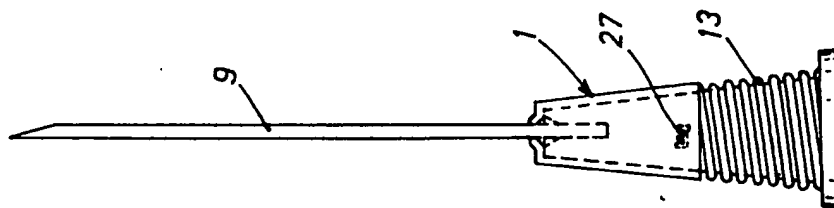


FIG.2

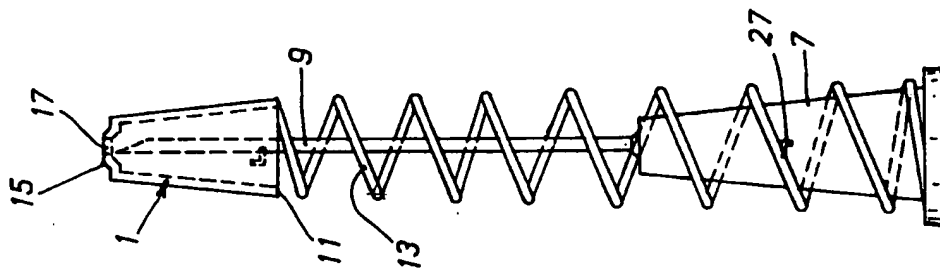


FIG.3

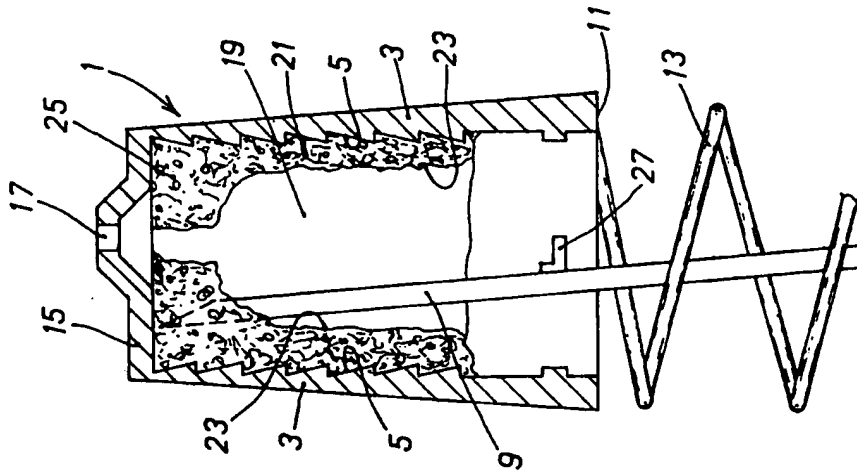


FIG.4

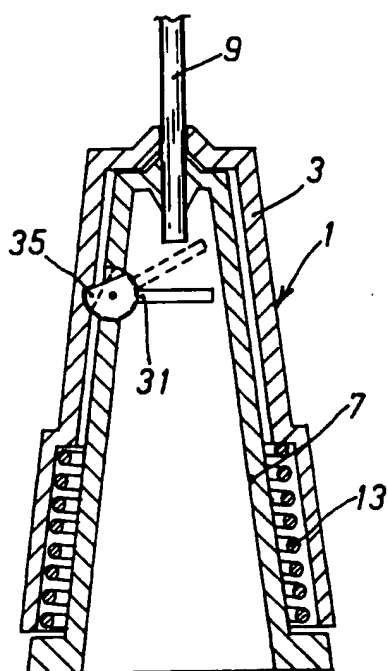


FIG. 5

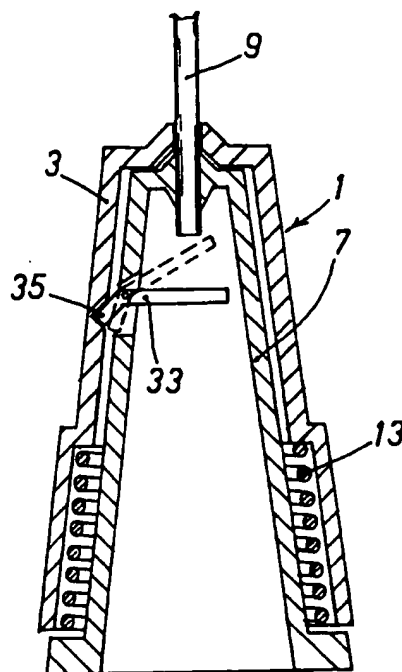


FIG. 6

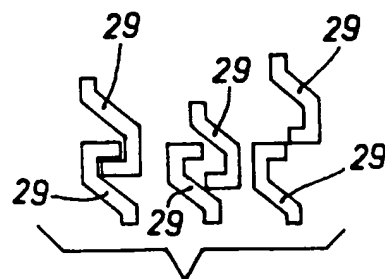
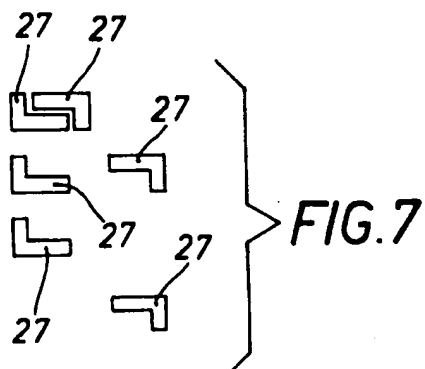


FIG. 8

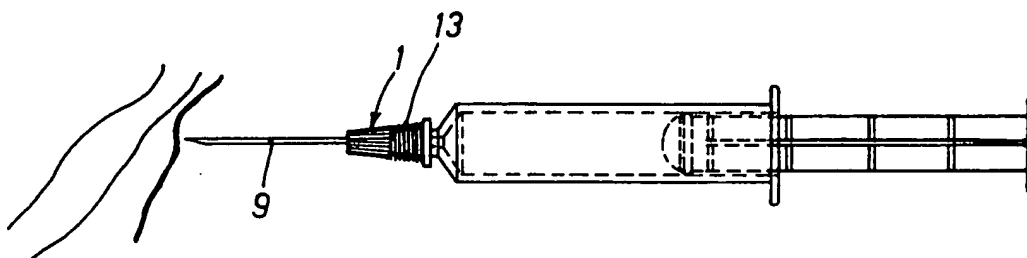


FIG. 9

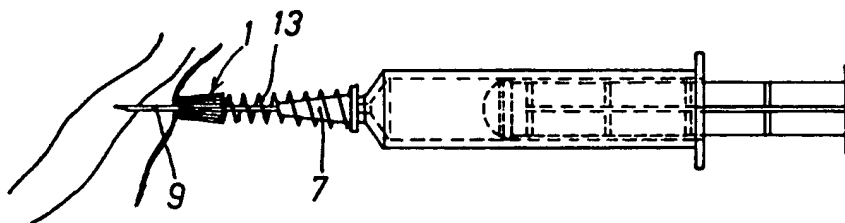


FIG. 10

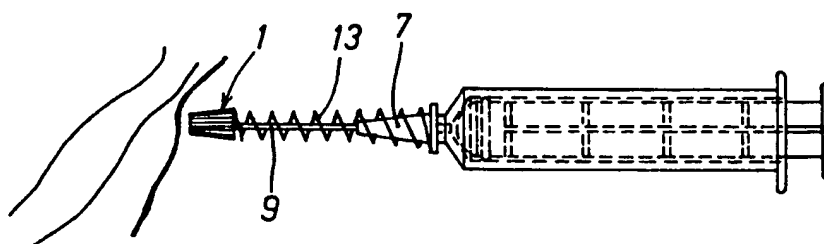


FIG. 11